NON-PUBLIC?: N
ACCESSION #: 9506190316
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Washington Nuclear Plant - Unit 2 PAGE: 1 OF 4

DOCKET NUMBER: 05000397

TITLE: Reactor Scram During Surveillance Testing Due to
Protective System Relay Failure

EVENT DATE: 04/05/95 LER #: 95-006-01 REPORT DATE: 06/08/95

OTHER FACILITIES INVOLVED: N/A DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
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COMPONENT FAILURE DESCRIPTION:
CAUSE: B SYSTEM: JB COMPONENT: RLY MANUFACTURER: A348
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

At 0957 hours on April 5, 1995, with WNP-2 at 100% power, a main turbine trip occurred during performance of a surveillance test. When a high reactor water level condition was simulated by opening the equalizing valve on the channel B differential pressure transmitter, the main turbine and one reactor feed pump turbine tripped. This trip occurred because a normally energized Agastat relay in channel A had previously failed in an intermediate position, generating a second trip signal. The reactor scrammed on the turbine governor valve fast closure signal that resulted from the turbine trip. All control rods inserted normally. Operators placed the reactor in a stable condition.

The cause of the relay failure was heating of the coil due to shorted windings. The failed relay was replaced.

This event, which is bounded by analysis in WNP-2's Final Safety Analysis Report, had negligible safety significance.

END OF ABSTRACT

Event Description:

At 0957 hours on April 5, 1995, with WNP-2 in Operational Condition 1 (Power Operation) at 100% power, the main turbine TA, TRB! tripped during performance of a surveillance test. This test verifies operability of the high reactor AD, RCT! water level turbine trip feature. When a high reactor water level condition was simulated on the channel B instrument, the main turbine and Reactor Feed Pump A SJ, P! turbine tripped. This trip occurred because a normally energized relay RLY! in channel A had previously failed in an intermediate position, generating a second trip signal. The main turbine and reactor feed pump turbines trip if high reactor water level is sensed on 2 out of 3 level instruments.

Since reactor power was above 30 percent, the reactor scrammed on the turbine governor valve TA! fast closure signal that resulted from the turbine trip. All control rods AA, ROD! inserted normally.

The decrease in steam load resulting from the turbine trip caused reactor pressure to increase. Although the turbine bypass valves JI! opened in response to the increasing reactor pressure, their capacity is only 25% of rated steam flow. The reactor pressure increase was terminated by the combined effects of the reduced steam production due to the scram, the operation of the turbine bypass valves, and the opening of four main steam safety/relief valves SB, RV! in relief (pneumatically operated) mode. Reactor pressure had increased from its initial value of 1009 psig to 1078 psig.

Immediate Corrective Action:

Operators placed the reactor in a stable condition.

Further Evaluation:

The reactor scram was reported at 1324 hours on April 5, 1995, via the Emergency Notification System per 10 CFR 50.72(b)(2)(ii) as an ". . . event or condition that results in a manual or automatic actuation of . . . the Reactor Protection System . . ." This LER is submitted per the similar requirement of 10 CFR 50.73(a)(2)(iv).

There were no structures, systems, or components that were inoperable at the start of the event that contributed to the event. Plant systems and components operated as expected except as described below:

Reactor Feed Pump Turbine B normally trips on a high reactor water level on 2 out of 3 channels, but did not in this event because of the relay failure. This did not adversely affect the recovery from

the scram; in fact, operators used this pump to restore and maintain reactor water level.

Reactor recirculation pumps tripped from 60 Hz operation due to an end-of-cycle recirculation pump trip feature that opens the 60 Hz pump motor supply breakers BKR! on a turbine trip when reactor power is above about 30%. The recirculation pump control system is designed to supply 15 Hz power to the pumps after they have coasted down, but Reactor Recirculation Pump B did not transfer to 15 Hz power. The transfer failure was caused by a mispositioned circuit breaker for the pump motor's MO! low frequency motor generator MG! voltage regulator RG!. This 240 volt, 50 amp circuit breaker, which is inside a normally closed cabinet CAB!, is believed to have been inadvertently bumped and opened during installation of a plant modification on March 3, 1995, since the pump motor had been operated on 15 Hz power on March 2, 1995. There is no indication of this breaker's position in the control room.

Root Cause:

The cause of the relay (Amerace Agastat Model GPI, Serial No. 8624, Coil Number 3402H) failure was determined to be heating of the coil CL! due to shorted windings. This normally energized 120 volt 60 Hz relay, which had been in service for 3.7 years, had failed in an intermediate position sometime after the last successful surveillance test on March 9, 1995. In this intermediate position, the relay generated a trip signal but not a trip indication in the control room, since the normally closed contacts providing the trip indication did not close. The relay manufacturer examined the failed relay and stated that this type of failure had not been seen before. The Supply System concludes this unique failure does not have generic impact.

Further Corrective Actions:

The failed relay was replaced before plant startup.

Safety Significance:

This event is bounded by analysis in WNP-2's Final Safety Analysis Report for a turbine trip from 105% power without bypass valve operation. The consequences of this analyzed transient are acceptable and are limited to discharge of normal coolant activity to the suppression pool via safety/relief valve operations. This event was less significant since it occurred from a lower initial power level and the bypass valves opened to mitigate the reactor pressure increase.

The relay failure would not have prevented a Reactor Feed Pump B turbine trip during an actual high reactor water level condition, since the B and C level trip channels were not affected. Had an additional failure disabled either the level B or C trip channels, the Reactor Feed Pump A turbine trip, main turbine trip and reactor scram functions would have been unaffected. Control room operators would be directed by procedures to trip Reactor Feed Pump B before water induction into its turbine occurred.

WNP-2's Final Safety Analysis does not assume automatic 15 Hz reactor recirculation pump operation following a loss or trip of the 60 Hz power supply. Additionally, one reactor recirculation pump operating on 15 Hz power prevents thermal stratification in the reactor vessel. The loss of the automatic shift to 15 Hz feature for Reactor Recirculation Pump B was not safety significant.

This event had negligible safety significance.

Previous Similar Events:

In July 1994, the Supply System identified a generic problem with failure of normally energized Agastat relays. The failure mode was cracking and structural breakdown of the coil bobbin caused by heat induced degradation, causing impeded motion of the relay armature and inability of the relay contacts to change state. Corrective actions included replacement of normally energized Agastat relays in safety-related applications, and development of a preventive maintenance plan for plant relays (expected to be completed in July 1995).

The relay failure described in this LER differed from the earlier problem in that it was caused by shorted windings rather than gradual heat induced degradation; vendor representatives also confirmed these failures were not related. Thus the corrective actions taken or planned for the earlier problems would not have been expected to prevent this event.

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